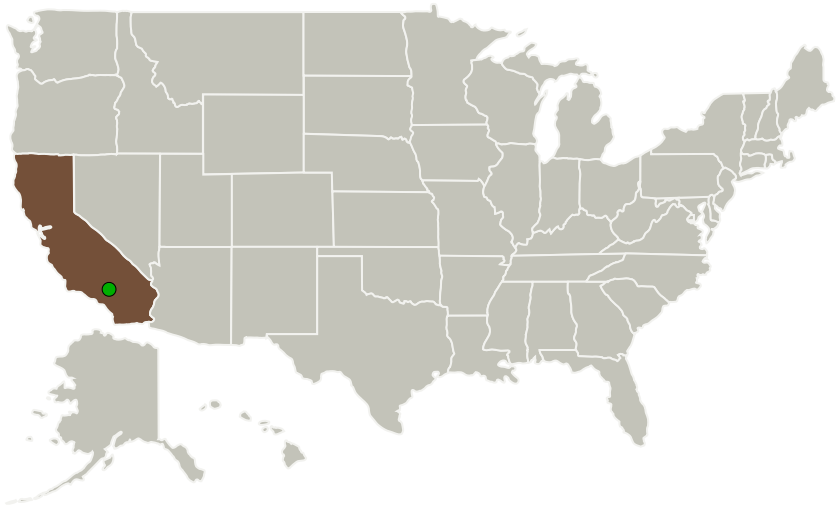
Real-Time Methods for Adaptive Suppression of Adverse Aeroservoelastic Dynamics, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Adverse aeroservoelastic (ASE) interaction is a problem on new and existing aircraft of all types causing repeated loading, enhanced fatigue and undesirable oscillations for pilots. Traditionally, to suppress adverse ASE interaction, notch and/or roll off filters have been utilized in the flight control system architecture to effectively "cancel out" problematic frequencies that will potentially excite the ASE dynamics. This solution has pitfalls; rigid body performance is degraded due to the resulting phase penalty and the filter is not robust to unexpected or un-modeled off nominal behavior. STI proposes an adaptive approach, which is leveraged by the adaptive Higher Harmonic Control (HHC) algorithm for high frequency disturbance rejection. This adaptive approach is robust to system variations, minimizes lower frequency phase penalty, and has been utilized for similar dynamic systems with supporting experimental validation. Development of the adaptive HHC algorithm for ASE suppression will be accomplished utilizing a high fidelity model of a representative high-speed fighter aircraft that is capable of parameter variation consisting of flight condition changes, configuration changes (stores configurations) as well as damage and failures. Validation of the proposed approach will be accomplished via simulation with representative parameter variations. Validation via real-time piloted simulations is proposed for future studies.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Systems Technology, Inc	Lead Organization	Industry	
Armstrong Flight Research Center(AFRC)	Supporting Organization	NASA Center	Edwards, California

Primary U.S. Work Locations
California

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139922)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Systems Technology, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brian P Danowsky

Co-Investigator:

Brian Danowsky

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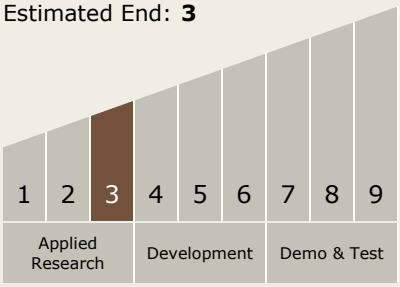
Technology Maturity (TRL)

Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX10 Autonomous Systems
  - TX10.4 Engineering and Integrity
    - TX10.4.1 Verification and Validation of Autonomous Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System